ON THE HIGH FREQUENCY ASYMPTOTIC EVALUATION OF THE POTENTIALS OF ELEMENTAL SOURCES ON AN ANISOTROPIC IMPEDANCE CYLINDER

Ronald J. Pogorzelski
Jet Propulsion Laboratory
California Institute of Technology
Pasadena, CA 91109

The high frequency surface fields of a *uniform* magnetic line source on an impedance cylinder have been studied by Paknys and Wang [IEEE Trans. AP-35, March 1987, 293-298]. The approach is similar to that in Chang, Felsen, and Hessel's treatment of the general ray direction case for axial and azimuthal magnetic sources [PINY Final Report, Sept. 1975 - Feb. 1976, AD A033544] in that for large distances the relevant integral is evaluated as a residue series and for small distances it is expressed as a power series. Paknys and Wang have shown that, for the examples discussed, twelve power series terms are required to achieve an approximation which agrees with the residue series at intermediate distances when two residue terms are retained. On the other hand, Wait [J. Res. NBS, Vol. 56, No. 4, April 1956, 237-243] and Hill and Wait [Radio Science Vol. 15, No. 3, May-June 1980, 637-643] have exploited an early suggestion of Bremmer, which he later published [IRE Trans. AP-9, July 1958, 267-272], to compute a small curvature approximation which agrees with the two term residue series at intermediate distances using only three terms.

The present work extends the work of Hill and Wait to the general case treated by Pearson [IEEE Trans. AP-35, June 1987, 698-707] accommodating both electric and magnetic sources and general ray propagation directions on the surface. It is verified that for large distances the residue series is convenient. For small distances, however, the power series representation is not very useful in that the many terms required are impractically cumbersome. In this work the small curvature approximation is generalized to non-azimuthal ray directions by means of a partial fraction expansion of a large argument approximation of the relevant integrand. This results in a practically useful approximation complementing the residue series and these two approximations thus provide representations valid throughout the entire range of distances.

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